



# Coast to Cactus Weather Examiner

## National Weather Service - San Diego



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January 2010

### A Wet and Wild Week by Ted Mackechnie and Miguel Miller

A persistent west coast upper ridge resisted pacific short waves for the first month of winter, yielding mostly fair and warm weather. Then a hemispheric pattern change pushed the ridge to the east, opening the door for broad, moist cyclonic westerly flow into Southern California, resulting in heavy rain during the one week period of 17-23 January 2010.

The pattern included a strong jet of 180-200 knots extending across the Pacific along a latitude of 30-35 degrees north. This brought a series of strong storms into Southern California. These storms brought heavy rain and snow, flooding, severe weather (including at least one tornado), high surf, and damaging winds.

**Tornado:** A tornado in Sunset Beach and Huntington Beach damaged roofs and trees, and overturned one vehicle.

**Flooding:** Hundreds were the reports of flooded streets and roadways in urban areas. There were also numerous



A tornado approaches Huntington Beach on 19 January as seen from an offshore oil platform. AP photo.



Floodwaters enter the parking lot at Qualcomm Stadium in San Diego on 21 January. Photo by Rob Hutsel, San Diego County Flood Control.

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## A Wet and Wild Week—continued

reports of mud and rocks washing onto rural roads. In the high desert there were numerous reports of roads washed out and homes flooded. Two deaths in Tijuana were unconfirmed, but attributable to the floods there.

The rivers responded as well. The San Diego River crested a few inches below flood stage at 11.23 feet. A berm broke and flooded Qualcomm Stadium parking lot and roads were barricaded in Mission Valley due to flooding. The Santa Margarita River crested one foot below flood stage at 10.75 feet. The Mojave River crested at 14.5 feet. A small earthen dam broke at Mojave Narrows Park causing minor flooding.

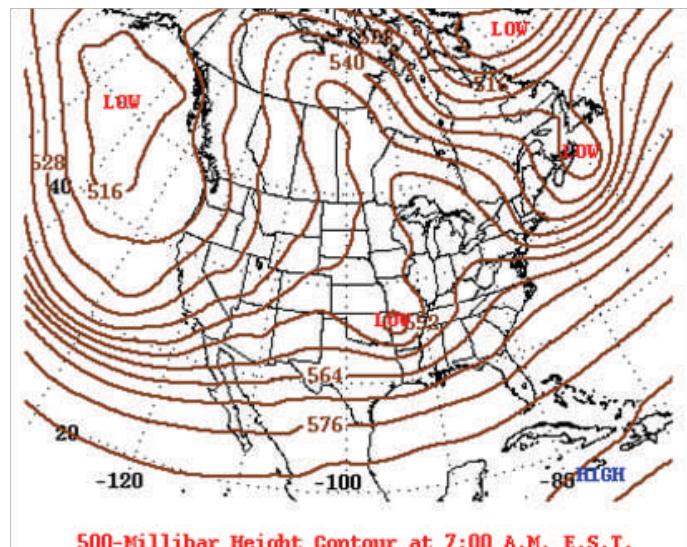
17 swift water rescues were made in Del Mar after a squall line passage. A teen was rescued from the Santa Ana River. About 300 water rescues were performed in the high desert.

**Wind:** Wind gusts were measured at 93 mph at Newport Beach and 92 mph at Huntington Beach around the time of the tornado. Wind gusts in excess of 60 mph hit San Clemente. Wind gusts over 50 mph were common along the coast and in the coastal waters. A tree fell onto mobile home resulting in one fatality in Lakeside. Scattered tree damage occurred due to soggy soil and strong winds. Homes and vehicles were damaged by fallen trees in the high desert.

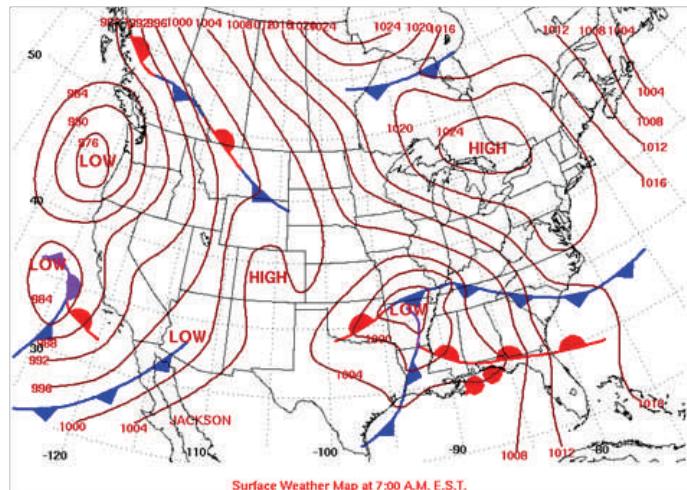
**Snow:** Five to seven feet of snow damaged homes, closes highways, and caused power outages in the San Gabriel and San Bernardino Mountains. After the storm there was a serious avalanche threat on north facing slopes according to the National Ski Patrol.

**Surf:** Surf exceeded 15 feet at many beaches.

**Interesting Stuff:** The surface pressure fell to an all-time record low of 29.15 inches (987.1 mb) at San Diego Lindbergh Field on 21 January. Reliable surface pressure records at San Diego date back to the year 1880. The tornado at Huntington Beach on 19 Jan is the 23rd confirmed tornado in the San Diego NWS forecast area since 2004.



The 500 millibar chart shows the strong jet stream aimed directly at Southern California on 21 January.



The surface chart shows the strong cold front and extremely low pressure on 21 January.

## Verifying El Niño by Mark Moede

El Niños and La Niñas come and go. Each winter we get the official El Niño/La Niña forecast from the Climate Prediction Center. During an El Niño, the climate prediction forecasters state that it increases the chances of above average rainfall in Southern California. With La Niña conditions, there is a greater chance for below average rainfall.

Have you ever wondered about the accuracy of those El Niño predictions? For instance, just how often does an El Niño bring above average rainfall to Southern California? And how often does a La Niña produce below average rainfall?

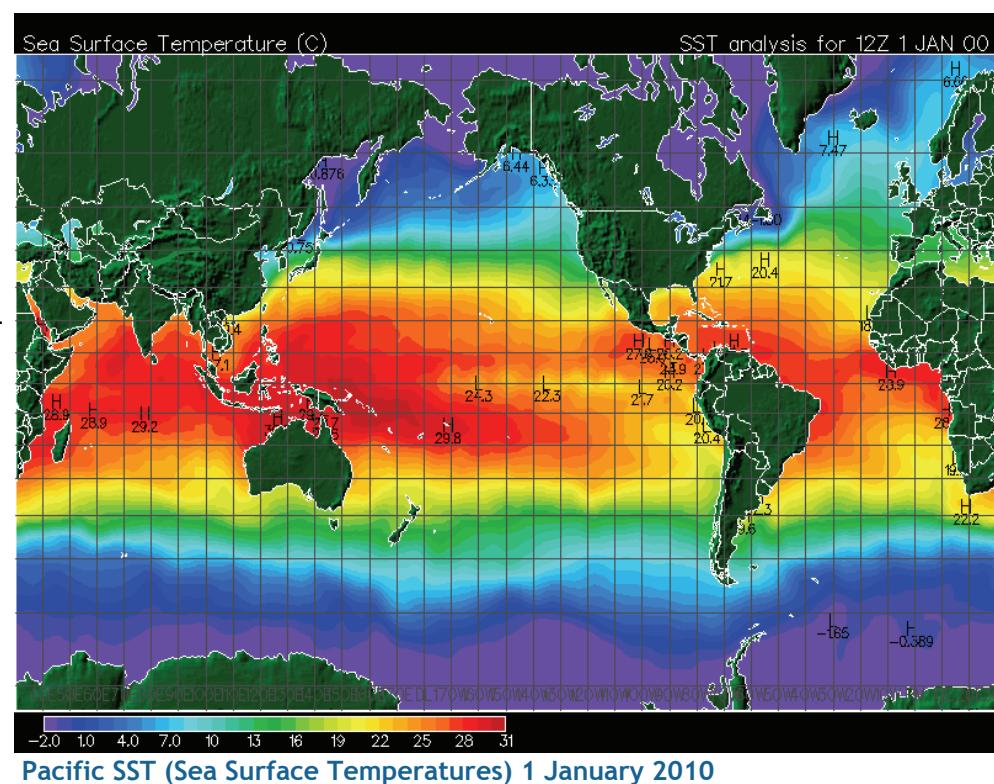
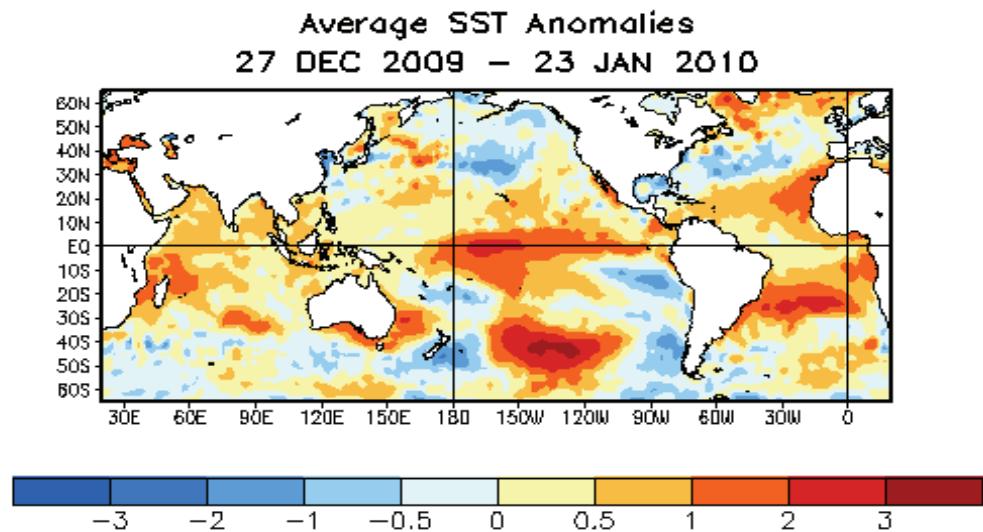
We went back and looked at the rainfall data over the past 15 years (1994-2009). We compared the rainfall observed at several stations in Southern California with the official El Niño/La Niña forecasts from the Climate Prediction Center. The stations include San Diego's Lindbergh Field, Santa Ana, Riverside, Big Bear and Palm Springs.

The results were a little surprising!

But first, a little background on what is called the "Oceanic Niño Index".

### Oceanic Niño Index (ONI)

The Climate Prediction Center uses the Oceanic Niño Index (ONI) to determine whether we are in an El Niño (warm event) or a La Niña (cool event). The ONI is a three month running average of sea surface temperature anomalies in a certain spot in the Pacific called the Niño 3.4 region.



## Verifying El Niño – continued

- El Niño is characterized by a *positive* ONI greater than or equal to +0.5°C.
- La Niña is characterized by a *negative* ONI less than or equal to -0.5°C.

As of this writing, the January 2010 ONI was +1.5, which is a moderately strong El Niño signature. A really cool table showing the history of the Oceanic Niño Index dating back 1950 is found at: [www.cpc.noaa.gov/products/analysis\\_monitoring/ensostuff/ensoyears.shtml](http://www.cpc.noaa.gov/products/analysis_monitoring/ensostuff/ensoyears.shtml).

**What do we notice...on the reliability of this rainfall predictor for Southern California?**

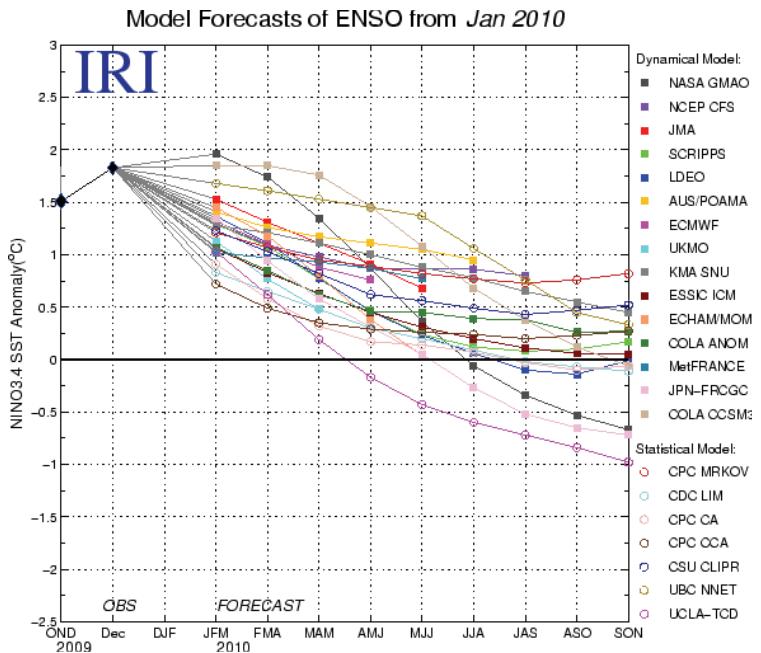
- An El Niño signature does not guarantee a wetter than average winter in Southern California.
- The stronger the El Niño signature (> +1.0), the better our chances for average or above average rainfall. (See 1994-95, 1997-98, 2002-03)
- The 2004-05 weak El Niño (+0.6) combined with the MJO brought the 3<sup>rd</sup> wettest year on record in San Diego.
- Conversely, La Niña conditions usually resulted in below average rainfall.
- Only the 2008-09 La Niña (-0.8) brought rainfall totals that came close to average.
- And to make it even more puzzling, the driest year on record (2001-02) occurred without any strong signal, neither La Niña nor El Niño (3.02") !!

Year	Oceanic Niño Index	Rainfall (inches and % of normal)				
		San Diego N = 10.77	Santa Ana N = 11.23	River-side N = 10.22	Big Bear N = 21.41	Palm Springs N = 5.23
1994-95	+1.2 (El Niño)	17.12" +158%	26.00 231%	17.02 166%	33.04 154%	7.75 148%
1995-96	-0.7 (La Niña)	5.11" 47%	11.15 99%	6.10 60%	15.13 70%	1.25 24%
1996-97	-0.4 (Weak La Niña)	7.00" 64%	15.03 133%	7.53 73%	12.50 58%	1.31 24%
1997-98	+2.3 (El Niño)	17.78" 165%	31.03 276%	22.06 215%	20.25 95%	8.10 155%
1998-99	-1.4 (La Niña)	6.72" 62%	6.98 62%	5.61 55%	8.10 38%	0.76 14%
1999-2000	-1.6 (La Niña)	5.78" 53%	8.10 72%	6.15 60%	15.22 70%	1.74 14%
2000-01	-0.7 (La Niña)	8.61" 80%	15.02 133%	5.95 58%	14.10 66%	4.55 87%
2001-02	-0.1 (No Strong Indicator)	3.02" driest ever 28%	3.55 32%	3.10 30%	5.50 36%	0.33 6%
2002-03	+1.1 (El Niño)	10.62" 98%	14.22 126%	13.95 136%	20.51 96%	3.50 67%
2003-04	+0.4 (Weak El Niño)	5.18" 48%	6.17 54%	6.36 62%	16.02 75%	3.79 72%
2004-05	+0.6 (El Niño) and MJO	22.49" 3 <sup>rd</sup> wettest ever 208%	25.19 224%	21.20 207%	42.92 200%	11.23 214%
2005-06	-0.8 (La Niña)	5.42" 50%	7.75 69%	7.10 69%	20.09 93%	3.25 62%
2006-07	+0.8 (Brief El Niño)	3.85" 35%	2.20 20%	6.94 19%	3.98 19%	0.50 9%
2007-08	-1.4 (La Niña)	7.25" 67%	8.20 73%	5.60 55%	20.04 93%	5.26 100%
2008-09	-0.8 (La Niña)	9.18" 85%	7.76 69%	5.85 57%	15.02 70%	4.96 95%
2009-10	+1.5 (El Niño)				???"	

## Verifying El Niño – continued

### What do we know about the current El Niño?

- El Niño is present across the equatorial Pacific Ocean.
- Sea surface temperatures (SST) are 1.0°C-2.5°C above-average across the central and east-central equatorial Pacific.
- A majority of the models indicate that the current El Niño episode is near or at its peak (as shown at right).
- After peaking, nearly all models indicate the ONI will gradually decrease, with about half of the models indicating that El Niño will continue into April-May-June 2010.

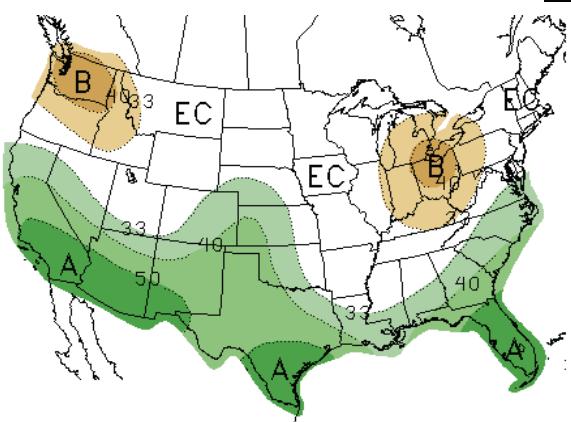


### What does it mean for us?

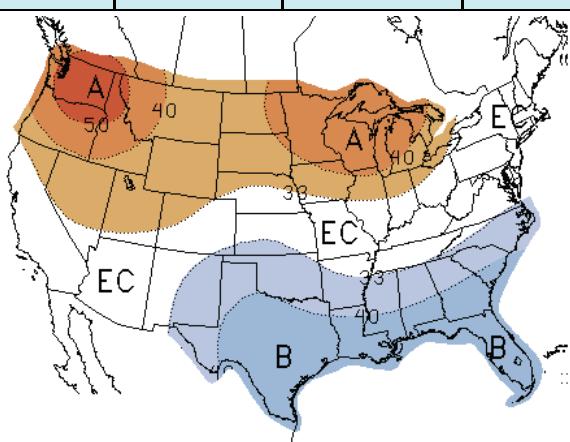
The chart at right shows the current seasonal rainfall at various Southern California stations through January. All are running above normal and a few are more than 150% of normal.

The Climate Prediction Center uses long term trends, soil moisture, and El Niño/La Niña considerations to formulate their outlooks of precipitation and temperature. The nationwide outlooks of precipitation and temperature for February through April are shown below. There remains a **high probability of above normal rainfall** for Southern California.

Normal Rainfall (1971-2000)	1 Jul 2009-31Jan 2010	1 Jul 2009-31 Jan 2010 Normal	% of Normal
Campo	10.12	8.23	123
Fullerton Airport	10.07	4.94	204
John Wayne Airport	9.06	6.53	139
Los Angeles Int'l Airport	7.66	6.58	116
Long Beach Airport	9.94	6.48	153
Ontario Airport	9.89	7.03	141
Palm Springs Airport	5.82	3.26	179
Ramona Airport	11.32	7.81	145
Riverside Airport	7.99	4.92	162
San Diego Lindbergh Field	5.78	5.43	106
Thermal Airport	3.23	2.33	139



CPC's Febrary through April outlooks for Precipitation (left) and Temperature (right).



# Quarterly Summary

## October

Low pressure aloft over the southwest U.S. brought cool and dry weather during the first week of the month. After catching the tail end of a storm around the 13th, high pressure rebuilt over the region bringing dry and warm weather through the middle of the month. Another fast-moving trough brought strong winds and cooling around the 20th, and again on the 28th, but high pressure off the coast kept a dry northwest flow over the area for seasonal weather for the final days. Average monthly temperatures were two to three degrees below normal.

San Diego - Lindbergh Field Data - October				
	Max	Min	Avg	Rain
Actual	71.8	59.4	65.6	Trace
Normal	74.0	61.2	67.6	0.44
Anomaly	-2.2	-1.8	-2.0	-0.44
% of normal				0
Max	85	66		Trace
Min	67	50		

### Precipitation Summary

A powerful storm in Northern California sent some light precipitation over Southern California on the 13th and 14th. Rainfall decreased rapidly from northwest to southeast. Portions of northwest Orange and extreme southwest San Bernardino County received between one and three inches, while most other areas had around one-quarter inch or less. Greatest amounts were along the coastal slopes of the mountains.

Isolated showers developed ahead of a strong cold front on the 27th. The showers mainly affected the San Jacinto Mountains around Idyllwild where up to 0.40 inch was reported.

October rainfall was near, to slightly above normal for Orange County and northwest. With the exception of the higher peaks, rainfall amounts were less than 25% of normal.

## November

A weak high pressure ridge brought dry and pleasant weather to the region to start off November. Only southern San Diego County experienced a few light showers late in the first week thanks to a strong southerly flow ahead of a storm system off the Baja California coast. During the second week, dry offshore flow turned onshore as low pressure deepened across the west, bringing clouds and a few scattered showers on the 12th. For the next two weeks the main storm track was far to the north, and a dry northwest flow prevailed with periods of offshore surface winds. Over the Thanksgiving weekend, the storm track pushed south over the area bringing moderate rain and snow showers. Dry offshore flow returned to end the month. Average monthly temperatures were close to or slightly above average across southwestern California.

San Diego - Lindbergh Field Data - November				
	Max	Min	Avg	Rain
Actual	69.4	53.0	61.2	0.12
Normal	69.9	53.6	61.8	1.07
Anomaly	-0.5	-0.6	-0.6	-0.95
% of normal				11
Max	78	60		0.12
Min	61	47		

### Precipitation Summary

A strong southerly flow ahead of developing low pressure off the coast of Baja California pushed a few showers into southern portions of San Diego County very early on the morning of November 6th. Rainfall was less than 0.10 inch.

## Quarterly Summary—continued

Scattered showers developed very early on the 12th as a weak low pressure trough moved through the region. Heaviest amounts fell in the foothills of the San Bernardino Mountains where remote gages reported up to 0.50 inch.

A cold low pressure area moved through the region on the 28th and 29th with moderate, to locally heavy rain and snow showers. Precipitation was heaviest on the coastal slopes, with over one inch reported in several spots in the San Bernardino and San Diego County Mountains. The snow level fell to around 5000 feet resulting in six to twelve inch snowfall at the higher elevations. Rainfall varied from less than 0.10 an inch in Orange County, to nearly two inches in the wettest foothills in San Diego County. The San Diego County coast and valleys got between 0.25 and 1.25 inches. The San Bernardino County foothills and coastal slopes received around 0.50 to 1.50 inches, while the Inland Empire only reported around 0.25 inch. The desert areas got mostly 0.10 inch or less, except for spots in the high deserts which logged up to 0.25 inch.

For the month, most areas had under 50% of normal precipitation. For the young season, most remained near, or below a third of normal.

### December

December turned decidedly stormy as a strong, blocking high pressure ridge built north through the Gulf of Alaska and allowed the Polar Jet to split and cross the Pacific at lower latitudes. Several systems teamed up to bring heavy rain and mountain snow to the region during the first two weeks. The storm track shifted back to the north about the middle of the month as a broad high pressure ridge built and held for the next couple of weeks, bringing dry and mild weather, except for a glancing blow from a cold system from the north around the 22nd. One more period of light rain was observed around the 30th. Otherwise, a weak trough brought seasonally cool weather to wrap up the year. Average monthly temperatures were between one and three degrees below normal.

San Diego - Lindbergh Field Data - December				
	Max	Min	Avg	Rain
Actual	63.4	49.9	56.7	2.28
Normal	66.3	48.9	57.6	1.31
Anomaly	-2.9	1.0	-0.9	0.97
% of normal				174
Max	77	59		Trace
Min	55	42		

### Precipitation Summary

On December 7th, a moist system from the central Pacific combined with a sharp and cold trough from the north to create a powerful storm over southwest California. Gale to storm force wind and periods of moderate to heavy rain and snow pummeled the area. Rainfall from one to three inches was common, including the deserts. Heaviest rains fell in a band through central San Diego County with three to around four inches reported in the mountains and foothills. Other than urban flooding, no major problems were reported due to precipitation. Snowfall up to one foot was reported at resort levels in the San Bernardino and San Jacinto Mountains, and snow fell at higher elevations over the northern deserts. The San Diego River climbed above Monitor Stage and overtopped several low-water crossings in Mission Valley for a time.

From December 11th through the 13th, a series of disturbances moved across California from the central Pacific bringing periods of widespread moderate to locally heavy rainfall. Snow levels were quite high, so only the highest resort areas reported heavy snow of one foot or more. Over the three day period: 0.50 to 1.50 inches was reported over the coast and valleys, with three to

## Quarterly Summary—continued

six inches on the coastal slopes. Amounts tapered off from north to south across San Diego County, with three to five inches in the northern mountains, and two to three inches farther south. The deserts had 0.25 inch or less for the entire period.

Runoff from the mountains was sufficient to produce significant flow in the Whitewater River channel for a time. Early on the 13th a berm designed to divert the flow to nearby percolation basins failed north of Palm Springs, sending a wall of water several feet high over nearby low water crossings. Three cars were swept off the roads, but no one was injured.

A cold, low pressure trough diving south through eastern California brought very strong winds and showers of rain and snow across the region on the 22nd. Convection boosted some precipitation amounts as did upslope flow onto the coastal slopes and foothills where amounts reached around 0.50 inch. At lower elevations, most reports were less than 0.25 inch. Snowfall was confined to the highest elevations and was two inches or less.

On the 30th into the early morning of the 31st, a very moist air mass ahead of a weak warm frontal feature passed over Southern California bringing light rain. Except for some favored coastal slopes where up to 0.50 inch accumulated, rainfall amounts were less than 0.25 inch.

For the month, most areas had between 150% and 250% of normal precipitation, except for the northern deserts where amounts were closer to 50% of normal. Season to date, the heavy precipitation this month had pushed totals to between 75% and 125% of normal.

## Spotter and Skywarn News

Quite a barrage of storms, no? While it is still too early to say for sure if the series of January storms were a direct result of El Niño, it makes a compelling argument. Now with Punxsutawney Phil making his ground hog prediction of six more weeks of winter, we can probably expect more periods of wet weather all the way to the equinox! Normally, February and March are just as wet as January anyway.

Overall, the performance of spotters and the Skywarn organization has been quite good during this winter's storms. But there have also been some shortcomings and pitfalls.



Normally, desert flooding happens with summer thunderstorms. But Palm Springs had some serious flooding on 13 December. Photo by The Desert Sun.



Flooding in Vallecitos Wash in the Anza Borrego Desert on 21 January. Photo by spotter Frank Colver.

## Spotter and Skywarn News-continued

### The Good

- Reports were timely and to the point. Since 1 December, we have received 483 spotter reports, 161 by phone and 322 through the online reporting web page.
- Snowfall reports were more frequent
- Many spotters reviewed the training and reporting criteria beforehand, and it showed
- The new reporting web page functioned as it was designed to, with very little disruption

### The Not-So-Good

- The now discarded e-spotter was still used by about a dozen spotters. Remember, the new online reporting web page is [swskywarn.org/ReportWeather.php](http://swskywarn.org/ReportWeather.php).
- Many rainfall reports were missed because of clogged or otherwise malfunctioning rain gauges. It's a good idea to check your rain gauges for debris or other problems before the rain hits.
- Many rainfall reports came in with no additional information. When you report any rainfall amount or rate, please also describe any local flooding, even to report there isn't any.
- We could use more descriptive snowfall reports. Report clearly the snowfall period and the new snowfall amount. For example, "6 inches new snow since Tuesday afternoon. Total snow on the ground 14 inches (combined from storm last Friday and previous storms)". If you report the total snow depth, please clearly indicate such.

**As always, during these stormy times we rely on and appreciate our spotters!**

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Feedback on weather products and the NWS San Diego website: [www.wrh.noaa.gov/sgx/mail/feedback.php?wfo=sgx](http://www.wrh.noaa.gov/sgx/mail/feedback.php?wfo=sgx) (don't forget to manually include your return email address if you wish a response!).

Spotter reports online: [swskywarn.org/ReportWeather.php](http://swskywarn.org/ReportWeather.php)

Weather Spotter web site: [www.wrh.noaa.gov/sgx/spotter/spotter.php](http://www.wrh.noaa.gov/sgx/spotter/spotter.php)

(*Coast to Cactus* can always be found on this page.)

The *Weather Guide*, a weather companion and reference, is available online at:

[www.wrh.noaa.gov/sgx/research/Guide/weather\\_guide.php?wfo=sgx](http://www.wrh.noaa.gov/sgx/research/Guide/weather_guide.php?wfo=sgx)

Southwest California Skywarn© web site: [swskywarn.org](http://swskywarn.org) , e-mail: [swskywarn@swSkywarn.org](mailto:swskywarn@swSkywarn.org)

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